

2001 STARTING & CHARGING SYSTEMS

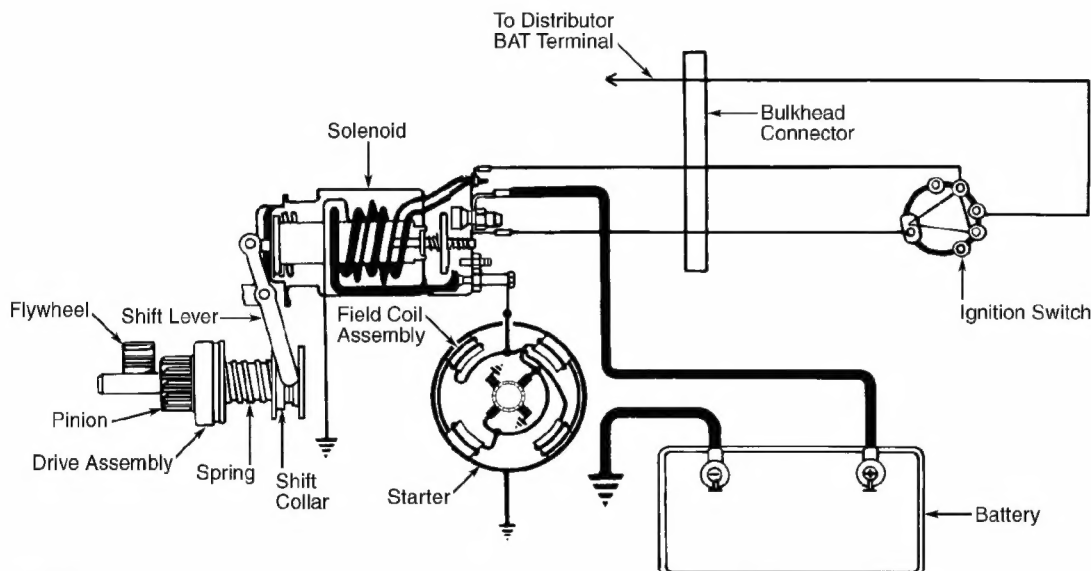
Starters - Blazer, Bravada, Jimmy, Sonoma & S10 Pickup

DESCRIPTION & OPERATION

WARNING: Vehicles are equipped with air bag supplemental restraint system. Before attempting any repairs involving steering column, instrument panel or related components, see **SERVICE PRECAUTIONS** and **DISABLING & ACTIVATING AIR BAG SYSTEM** in appropriate **AIR BAG RESTRAINT SYSTEMS** article.

When ignition switch is turned to START position, battery voltage is applied to Park/Neutral Position (PNP) switch for Automatic Transmission (A/T) or Clutch Pedal Position (CPP) switch for Manual Transmission (M/T). When shift lever is in Park or Neutral position (A/T) or clutch pedal is depressed (M/T), current is applied to coil of starter relay, energizing starter relay. Starter relay is permanently grounded at ground connection, located on right front side of engine block below generator (2.2L) or on rear of right cylinder head (4.3L). When starter relay is energized, current passes on to starter solenoid "S" terminal. This causes solenoid plunger to move shift lever, which engages pinion with engine flywheel ring gear. Movement of plunger also closes main solenoid contacts, applying battery voltage to starter motor. See **Fig. 1**.

When engine starts, pinion will overrun, protecting armature from excessive speed and flywheel from damage. When ignition switch is released, plunger return spring disengages pinion.



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Fig. 1: Typical Cranking Circuit Illustration
Courtesy of GENERAL MOTORS CORP.

STARTER APPLICATION

Engine	(1) VIN	Starter
2.2L (4-Cyl)	4	PG-260F
4.3L (V6)	W	PG-260G
(1) Eighth character of Vehicle Identification Number.		

COMPONENT LOCATIONS

COMPONENT LOCATIONS

Component	Location
Battery Fuse	Below Battery, Lower Right Of Radiator Core Support
Clutch Pedal Position Switch	Mounted To Clutch Pedal Support Bracket
Park/Neutral Position Switch	Left Side Of Transmission
Starter Relay	In Underhood Fuse Block
Underhood Fuse Block	On Left Fenderwell

TROUBLE SHOOTING

NOTE: For information not covered in this article, see **TROUBLE SHOOTING** article in **GENERAL INFORMATION**.

NOTE: Refer to appropriate wiring diagram to verify wire color and connector terminal identification. See **WIRING DIAGRAMS** .

Note condition and operation of SECURITY indicator light. If SECURITY indicator light stays on or flashes continuously, see appropriate ANTI-THEFT SYSTEMS article in ACCESSORIES & EQUIPMENT. Check starter solenoid terminals and battery grounds. Check for proper installation of aftermarket electronic equipment. If fault is found, repair as necessary. If fault is not found, perform self-diagnostics. See **SELF-DIAGNOSTIC SYSTEM** .

Check IGN C (20-amp) fuse and CRANK (10-amp) fuse located in underhood fuse block. Check BATTERY (175-amp) fuse located below battery on radiator core support. See **COMPONENT LOCATIONS** .

ON-VEHICLE TESTING

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CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See appropriate **COMPUTER RELEARN PROCEDURES** article in **GENERAL INFORMATION** before disconnecting battery.

NOTE: Before making electrical checks, visually inspect all terminals for clean, tight connections. Ensure all starting system related fuses are okay. Ensure battery is in good condition prior to testing starting system. See **BATTERY TESTING & INSPECTION**.

BATTERY TESTING & INSPECTION

NOTE: Manufacturer recommends using Battery Tester (J-42000) for testing battery. Follow instructions provided with tester.

1. Inspect battery for a cracked, broken or damaged case. If problem does not exist, go to next step. If problem exists, go to step 19 .
2. Compare battery cold cranking amperage and reserve capacity rating to specifications. See **BATTERY SPECIFICATIONS** table. If battery meets or exceeds specifications, go to next step. If battery does not meet or exceed specifications, go to step 19 .

BATTERY SPECIFICATIONS

Application	Specification
Standard	
Cold Cranking Amps	525
Reserve Capacity Rating	90 Minutes
Optional	
Cold Cranking Amps	690
Reserve Capacity Rating	90 Minutes

3. Inspect battery hydrometer display. If hydrometer display shows a Yellow dot, go to next step. If hydrometer display does not show a Yellow dot, go to step 5 .

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4. Using a small screwdriver, tap top of hydrometer display to dislodge any air bubbles inside. If hydrometer display still shows a Yellow dot, go to step 19 . If hydrometer display does not show a Yellow dot, go to next step.
5. Turn ignition switch to OFF position. Attempt to rotate negative battery cable connector clockwise with light finger pressure. If negative connector rotates, go to next step. If negative connector does not rotate, go to step 7 .
6. Using an INCH lb. torque wrench, record torque value while loosening negative battery cable bolt. If torque is equal to or greater than 88 INCH lbs. (10 N.m), go to step 8 . If torque is less than 88 INCH lbs. (10 N.m), go to next step.
7. Disconnect negative battery cable and go to step 9 .
8. Disconnect negative battery cable. Inspect battery and cable terminals for corrosion and defects. If problem exists, repair as necessary. After repair, go to next step.
9. Attempt to rotate positive battery cable connector clockwise with light finger pressure. If battery cable rotates, go to next step. If battery cable does not rotate, go to step [11](#) .
10. Using an INCH lb. torque wrench, record torque value while loosening positive battery cable bolt. If torque is equal to or greater than 88 INCH lbs. (10 N.m), go to step 12 . If torque is below 88 INCH lbs. (10 N.m), go to next step.
11. Disconnect positive battery cable and go to step 13 .
12. Disconnect positive battery cable. Inspect battery and cable terminals for corrosion and defects. If problem exists, repair as necessary. After repair, go to next step.
13. Clean and wire brush lead face of both battery terminals and metal contact surfaces on both cable connectors. Remove bolts from both battery cable connectors and inspect for corrosion and defects. If problem exists, repair or replace as necessary. If problem does not exist, go to next step.
14. Connect positive battery cable to battery and tighten bolt to 11 ft. lbs. (15 N.m). Go to next step.
15. Connect negative battery cable to battery and tighten bolt to 11 ft. lbs. (15 N.m). Go to next step.
16. Ensure all electrical loads are off. Follow manufacturer's instructions and install Battery Tester (J-42000) to vehicle battery. Follow any instructions displayed on Battery Tester. If Battery Tester passed battery, go to next step. If Battery Tester did not pass battery, go to step 18 .
17. Press CODE button on Battery Tester. Record displayed code on vehicle repair order for warranty purposes. Battery is okay.
18. Press CODE button on Battery Tester. Record displayed code on vehicle repair order for warranty purposes. Go to next step.
19. Replace battery.

SELF-DIAGNOSTIC SYSTEM

NOTE: Diagnostic trouble code tests are written specifically for use with GM Tech I or Tech II scan tools. Generic scan tool can be used but may have limited functions. This article only covers the portion of those systems which relates to starting system diagnosis. For further information, see appropriate **SELF-DIAGNOSTICS** article in **ENGINE PERFORMANCE** or **BODY CONTROL MODULES** article in **ACCESSORIES & EQUIPMENT**.

ENGINE ELECTRICAL DIAGNOSTIC SYSTEM CHECK

1. Perform battery inspection test. See **BATTERY TESTING & INSPECTION** under **ON-VEHICLE TESTING**. If battery passes test, go to next step.
2. Install scan tool to Data Link Connector (DLC). DLC is located below left side of instrument panel. Turn ignition switch to RUN position. If scan tool powers up, go to next step. If scan tool does not power up, perform **TEST A: SCAN TOOL DOES NOT POWER UP** under **SYSTEM TESTS** in appropriate **BODY CONTROL MODULES** article in **ACCESSORIES & EQUIPMENT**.
3. Turn ignition switch to RUN position. Attempt to communicate with Body Control Module (BCM), Driver's Information Center (DIC), Instrument Panel Cluster (IPC) and Powertrain Control Module (PCM). If scan tool communicates with BCM, DIC, IPC and PCM, go to next step. If scan tool does not communicate with BCM, DIC, IPC and PCM, perform **TEST B: SCAN TOOL DOES NOT COMMUNICATE WITH CLASS 2 DEVICE** under **SYSTEM TESTS** in appropriate **BODY CONTROL MODULES** article in **ACCESSORIES & EQUIPMENT**.
4. Using scan tool, select **DISPLAY DTCs** function for each module. Record all DTCs displayed, DTC status and specific module which set DTC. If scan tool displays any DTCs, go to next step. If scan tool does not display DTCs, repair starting system by symptom. See **SYMPTOM INDEX** table under **SYSTEM TESTS**.
5. If scan tool displays DTCs which begin with "U", perform appropriate test in accordance with DTC retrieved. See appropriate **BODY CONTROL MODULES** article in **ACCESSORIES & EQUIPMENT**. If scan tool does not display DTCs which begin with "U", go to next step.
6. If scan tool displays DTCs which begin with "B", perform appropriate test in accordance with DTC retrieved. See appropriate **BODY CONTROL MODULES** article in **ACCESSORIES & EQUIPMENT**. If scan tool does not display DTCs which begin with "B", repair starting system by symptom. See **SYMPTOM INDEX** table under **SYSTEM TESTS**.

SYSTEM TESTS

WARNING: Vehicles are equipped with Supplemental Inflatable Restraint (SIR) system. Before attempting any repairs involving steering column, instrument panel or related

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components, see **SERVICE PRECAUTIONS** and **DISABLING & ACTIVATING AIR BAG SYSTEM** in appropriate **AIR BAG RESTRAINT SYSTEMS** article in **ACCESSORIES & EQUIPMENT**.

NOTE: The following tests assume that engine and battery are operating normally and are at operating temperature, battery is charged, there are no engine problems that would cause a no-start condition, and no DTCs exist.

SYMPTOM INDEX

Symptom	Perform Test
Starter Solenoid Does Not Click	A
Solenoid Clicks, Engine Does Not Crank	B
Engine Cranks Slowly	C
Starter Motor Noise Diagnosis	D

TEST A: ENGINE DOES NOT CRANK, STARTER SOLENOID DOES NOT CLICK

1. If diagnostic system check was not performed, go to **ENGINE ELECTRICAL DIAGNOSTIC SYSTEM CHECK** under SELF-DIAGNOSTIC SYSTEM. If diagnostic system check was performed, go to next step.
2. Turn ignition switch to START position. If engine cranks when ignition switch is turned to START position, inspect for intermittents. See **TROUBLE SHOOTING** . If engine does not crank when ignition switch is turned to START, go to next step.
3. Turn ignition switch to START position. If starter motor relay "clicks", go to step 7 . If starter motor relay does not "click", go to next step.
4. Remove starter motor relay from underhood fuse block. Underhood fuse block is located on left fenderwell. Connect a test light between ground and starter relay socket No. 85 (Purple/White wire). Ensure transmission shift selector is in Park or clutch pedal is depressed. Turn ignition switch to START position. If test light illuminates, go to next step. If test light does not illuminate, go to step 6 .
5. Connect a test light between starter relay sockets No. 85 (Purple/White wire) and 87 (Purple wire). Ensure transmission shift selector is in Park or clutch pedal is depressed. Turn ignition switch to START position. If test light illuminates, go to step 13 . If test light does not illuminate, go to step 10 .
6. Turn ignition switch to OFF position. If vehicle is equipped with automatic transmission, disconnect Park/Neutral Position (PNP) switch harness connector. If vehicle is equipped with manual transmission, disconnect Clutch Pedal Position (CPP) switch harness connector. Turn ignition switch to RUN position. Connect a 10-amp fused jumper between starter relay control circuits of PNP switch or CPP switch. See **WIRING DIAGRAMS** . Ensure transmission shift selector is in Park or clutch pedal is

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- depressed. Turn ignition switch to START position. If test light illuminates, go to step 14 . If test light does not illuminate, go to step 11 .
7. Turn ignition switch to OFF position. Remove starter relay from underhood fuse block. Underhood fuse block is located on left fenderwell. Connect a test light between ground and starter relay socket No. 30 (Red wire). If test light illuminates, go to next step. If test light does not illuminate, go to step 17 .
 8. Connect a 30-amp fused jumper starter relay socket No. 30 (Red wire) and starter solenoid terminal "B" (Black wire). If engine cranks, go to step 13 . If engine does not crank, go to next step.
 9. If fuse in jumper wire blows, go to step 18 . If fuse in jumper does not blow, go to step 12 .
 10. Check control circuit of starter relay for an open or high resistance condition. If problem exists, repair as necessary and go to step 23 . If problem does not exist, go to step 19 .
 11. Check supply voltage circuit of starter relay coil circuit for an open or high resistance condition. If problem exists, repair as necessary and go to step 23 . If problem does not exist, go to step 15 .
 12. Check supply voltage circuit of starter solenoid for an open or high resistance condition. If problem exists, repair as necessary and go to step 23 . If problem does not exist, go to step 16 .
 13. Check for poor connections at starter motor relay. If problem exists, repair as necessary and go to step 23 . If problem does not exist, go to step 19 .
 14. Check for poor connections at PNP switch or CPP switch. If problem exists, repair as necessary. After repair, go to step 23 . If problem does not exist, go to step 20 .
 15. Check for poor connection at ignition switch harness connector. If problem exists, repair as necessary. After repair, go to step 23 . If problem does not exist, go to step 21 .
 16. Check for poor connection at starter solenoid. If problem exists, repair as necessary. After repair, go to step 23 . If problem does not exist, go to step 22 .
 17. Repair high resistance or open in battery positive voltage of starter relay coil circuit. See **WIRING DIAGRAMS** . If problem exists, repair as necessary. After repair, go to step 23 .
 18. Repair short to ground in supply voltage circuit of starter solenoid. See **WIRING DIAGRAMS** . After repair, go to step 23 .
 19. Replace starter relay. After repair, go to step 23 .
 20. If equipped with automatic transmission, replace PNP switch. See appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSIONS. If equipped with manual transmission, replace Clutch Pedal Position (CPP) switch. See appropriate CLUTCHES article in TRANSMISSIONS. After repair, go to step 23 .
 21. Replace ignition switch. See appropriate STEERING COLUMN SWITCHES article in

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ACCESSORIES & EQUIPMENT. After repair, go to step 23 .

22. Replace starter. See **STARTER** under REMOVAL & INSTALLATION. After repair, go to step 23 .
23. Operate system to verify repair. If system is not operating correctly, repeat test beginning at step 2 .

TEST B: SOLENOID CLICKS, ENGINE DOES NOT CRANK

1. If diagnostic system check was not performed, go to **ENGINE ELECTRICAL DIAGNOSTIC SYSTEM CHECK** under SELF-DIAGNOSTIC SYSTEM. If diagnostic system check was performed, go to next step.
2. Turn ignition switch to START position. If starter solenoid clicks, go to next step. If starter solenoid does not click, go to **TEST A: STARTER SOLENOID DOES NOT CLICK** .
3. Inspect engine and drive belt system for mechanical binding. If problem exists, repair as necessary. If problem does not exist, go to next step.
4. Check for open or high resistance in positive battery cable between battery and starter solenoid. If problem exists, repair as necessary. After repair, go to step 8 . If problem does not exist, go to next step.
5. Check for high resistance in battery and starter ground circuits. Repair as necessary and retest operation. If high resistance condition is found, repair as necessary and go to step 8 . If battery and starter ground circuits check okay, go to next step.
6. Check for poor connections at starter. If problem exists, repair as necessary. After repair, go to step 8 . If problem does not exist, go to next step.
7. Replace starter. See **STARTER** under REMOVAL & INSTALLATION. After repair, go to next step.
8. Operate system to verify repair. If system is not operating correctly, repeat test beginning at step 2 .

TEST C: ENGINE CRANKS SLOWLY

1. Ensure battery is in good condition. See **BATTERY TESTING & INSPECTION** under ON-VEHICLE TESTING. If problem exists, repair as necessary. If problem does not exist, go to next step.
2. Inspect wiring for damage or poor connections at starter motor, starter solenoid, battery and all grounds. If problem exists, repair as necessary. If problem does not exist, go to next step.
3. Inspect engine and drive belt system for mechanical binding. If problem exists, repair as necessary. If problem does not exist, go to next step.
4. Replace starter motor. See **STARTER** under REMOVAL & INSTALLATION.

TEST D: STARTER MOTOR NOISE DIAGNOSIS

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1. If diagnostic system check was not performed, go to **ENGINE ELECTRICAL DIAGNOSTIC SYSTEM CHECK** under SELF-DIAGNOSTIC SYSTEM. If diagnostic system check was performed, go to next step.
2. Start engine. If starter operates normally, inspect for intermittents. See **TROUBLE SHOOTING** . If starter does not operate normally, go to next step.
3. Start engine while listening to starter motor turn. If a loud "whoop" sound is heard, go to step 6 . If a loud "whoop" sound is not heard, go to next step.
4. If a "rumble", a "growl", or a "knock" sound is heard as starter is slowing down to a stop after starting engine, go to step 7 . If a "rumble", a "growl", or a "knock" sound is not heard as starter is slowing down to a stop after starting engine, go to next step.
5. If a high pitched "whine" sound is heard after engine cranks and starts normally, go to step 8 . If a high pitched "whine" sound is not heard after engine cranks and starts normally, go to step 7 .
6. Inspect flywheel ring gear for chipped, missing, or milled gear teeth and/or if flywheel is bent. If problem exists, go to step 9 . If problem does not exist, go to step 10 .
7. Remove starter motor. See **STARTER** under REMOVAL & INSTALLATION. Inspect starter motor bushings and clutch gear. If clutch gear has chipped or milled teeth or worn bushings, go to step 10 . If clutch gear does not have chipped or milled teeth or worn bushings, go to step 9 .
8. Shim starter motor away from flywheel by adding shims between engine block and starter motor. After repair, go to step 11 .
9. Replace flywheel. See appropriate AUTOMATIC TRANSMISSION REMOVAL article in TRANSMISSIONS. After repair, go to step 11 .
10. Replace starter motor. See **STARTER** under REMOVAL & INSTALLATION. After repair, go to next step.
11. Operate system to verify repair. If system is not operating correctly, repeat test beginning at step 3 .

BENCH TESTING

NOTE: Information is not available from manufacturer.

REMOVAL & INSTALLATION

WARNING: Vehicles are equipped with air bag supplemental restraint system. Before attempting any repairs involving steering column, instrument panel or related components, see **SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM** in appropriate **AIR BAG RESTRAINT SYSTEMS** article.

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CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See **COMPUTER RELEARN PROCEDURES** article in **GENERAL INFORMATION** before disconnecting battery.

NOTE: Vehicles are designed for starter mounting without shims. A single shim or double shims may have been added to correct a noise or engagement condition. When installing starter, any previously installed shims should be replaced in original location to ensure proper pinion to flywheel clearance.

STARTER

Removal & Installation (2.2L)

Disconnect negative battery cable. Remove engine-to-transmission brace rod bolts. Raise and support vehicle as necessary. Remove engine-to-transmission brace rod mounting bolts and nuts. Remove starter heat shield. Disconnect starter solenoid wiring. Remove starter mounting bolts. Remove shims and note arrangement for reassembly (if equipped). Remove starter assembly. To install, reverse removal procedure. Ensure shims are installed in original location (if equipped). Tighten fasteners to specification. See **TORQUE SPECIFICATIONS**.

Removal & Installation (4.3L)

Disconnect negative battery cable. Raise and support vehicle. Remove front differential carrier shield mounting bolts and front differential carrier shield (if equipped). Remove starter mounting bolts. Disconnect starter solenoid wiring. Remove shims and note arrangement for reassembly (if equipped). Remove starter assembly. To install, reverse removal procedure. Ensure shims are installed in original location (if equipped). Tighten fasteners to specification. See **TORQUE SPECIFICATIONS**.

OVERHAUL

NOTE: Information is not available from manufacturer.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Engine-To-Transmission Brace Bolts (2.2L)	37 (50)

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Front Differential Carrier Shield Bolts	18 (25)
Negative Battery Cable-To-Battery Bolt	11 (15)
Starter Mounting Bolts	
2.2L	32 (43)
4.3L	37 (50)
INCH Lbs. (N.m)	
Positive Battery Cable-To-Solenoid Nut	80 (9)
Solenoid "S" Terminal Nut	17 (1.9)

WIRING DIAGRAMS

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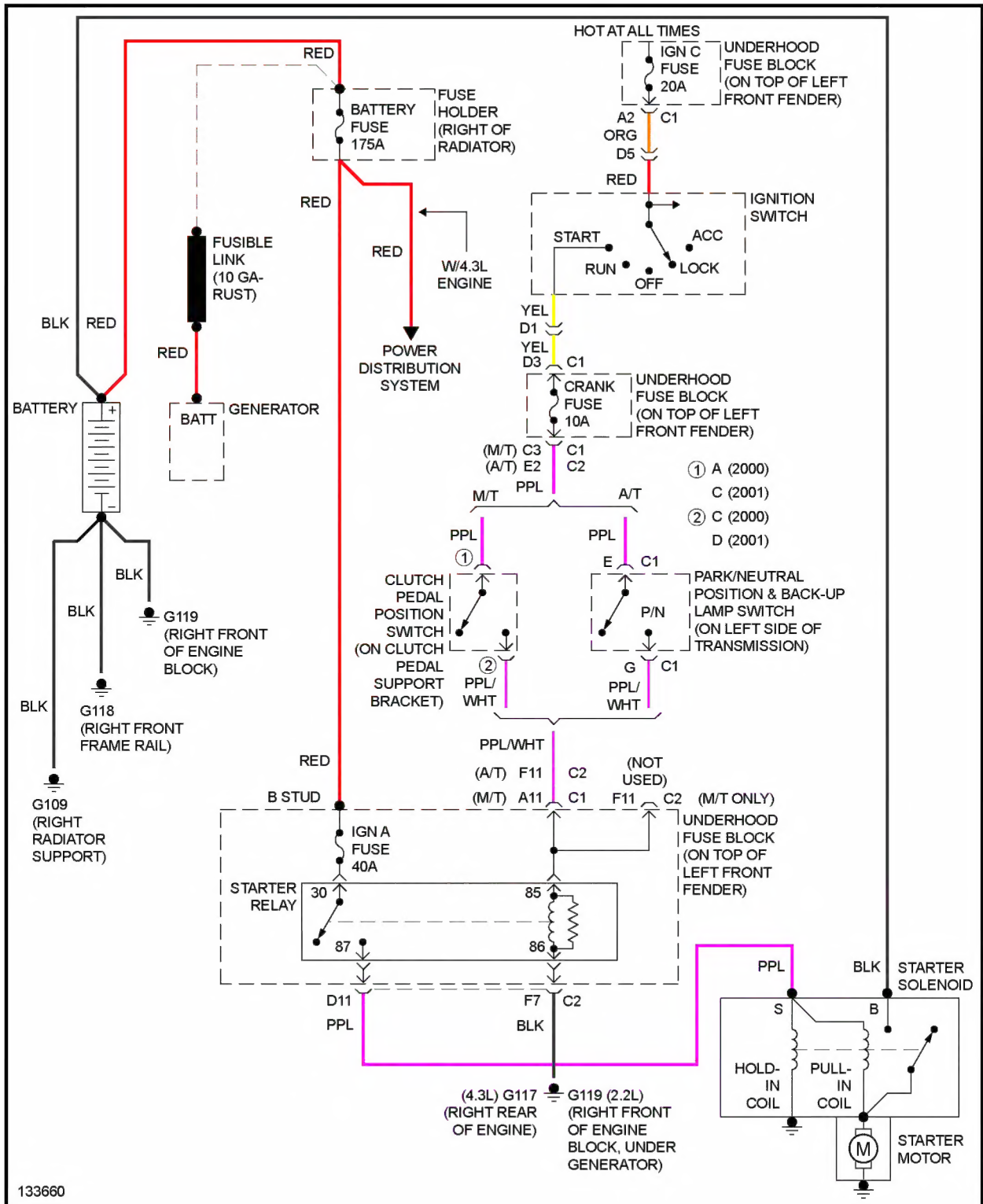


Fig. 2: Starting System Wiring Diagram (Blazer, Bravada, Jimmy, Sonoma & S10 Pickup)